



GROUNDWATER SAMPLING PLAN ASHLAND/NORTHERN STATES POWER LAKEFRONT SUPERFUND SITE

Prepared for

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URS

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1.0 PURPOSE

This Groundwater Sampling Plan (GSP) has been prepared in response to a request by the Wisconsin Department of Natural Resources (WDNR) for additional groundwater sampling and analysis to obtain current data regarding groundwater quality at the Ashland/NSP Lakefront Superfund Site (the "Site"). The most recent Site-wide groundwater quality data was obtained in March 2005 during the final quarterly groundwater sampling event of the Remedial Investigation (RI) phase for the Upper Bluff / Filled Ravine, Copper Falls Aquifer, and Kreher Park areas of concern (AC) at the Site. Specifically, the purposes of the additional groundwater monitoring are to:

- Provide a Site-wide snapshot of current groundwater quality. Groundwater quality data from a single sampling event that will include existing Site monitoring wells in support of historic sampling results;
- Provide interim data for the Copper Falls aquifer to evaluate the efficiency of the non-aqueous phase liquid (NAPL) recovery system, and
- Provide additional data on existing conditions following the in-situ chemical oxidation pilot test conducted during USEPA's SITE demonstration project completed in February 2007.

This GSP describes the methodology for collection of one round of Site-wide groundwater samples in August 2008 from wells within the three ACs. The Site-wide round of sample collection will then be followed by one groundwater sampling event for the Copper Falls Aquifer scheduled for April 2009. Subsequent groundwater sampling may also be necessary in support of remedial design, operation and maintenance of the selected groundwater remedy, and/or to establish baseline conditions prior to implementing the selected remedy at the Site. These other potential groundwater sampling events are not addressed by this GSP.

The laboratory analytical data obtained from the two rounds of sampling described in the GSP will be used solely to evaluate the concentrations of contaminants, typically associated with free product, and is not intended to be used in the future to evaluate groundwater conditions or trends across the entire site. This is because the sampling method proposed in the GSP will likely result in loss of volatile organic compounds (VOCs).

2.0 GROUNDWATER SAMPLING PLAN

2.1 Introduction

The sampling methodologies described herein are consistent with those provided in the groundwater sampling portion of the Field Sampling Plan¹ (FSP) developed for the RI. The applicable Standard Operating Procedures (SOPs) from the FSP referenced in this GSP are included as attachments to this plan. Quality Assurance/Quality Control (QA/QC) procedures for groundwater sampling and analysis, generally consistent with those contained in the project Quality Assurance Project Plan, will be utilized for the collection, preservation, packaging, and transport of samples, field testing, record keeping, data management, chain-of-custody procedures, and laboratory analyses. Variances from previous sampling events are identified in this document, in the appropriate sections.

Figure 2-1 shows the location of Site monitoring wells. Ten monitoring wells were documented during the RI to contain measurable amounts of NAPL. Typically, these wells have been excluded from previous groundwater sample events. The following wells have historically contained NAPL:

Wells Containing DNAPL or LNPL
MW-02AR (Copper Falls)
MW-02R (Filled Ravine)
MW-3 (NET) (Kreher Park)
MW-04B (Copper Falls)
MW-10B (Copper Falls)
MW-13A (Copper Falls)
MW-15 (Filled Ravine)
MW-15A (Copper Falls)
TW-09 (Kreher Park)
TW-11 (Kreher Park)

Water level and NAPL measurements will be conducted prior to sampling. If it is determined that any of the above wells contain more than 12-inches of NAPL, a groundwater sample will not be collected for laboratory analysis since it is assumed, based on previous sampling data from the Site, that such samples would contain high concentrations of dissolved-phase constituents. Further discussion of water level measurements and NAPL determination is provided in Section 2.4 of this GSP.

2.2 Sample Locations

During the Site-wide sampling event, groundwater samples will be collected from monitoring wells located in the Upper Bluff (Miller Creek Formation) / Filled Ravine, Copper Falls Aquifer, and Kreher Park ACs. Groundwater will be sampled from 14 monitoring wells screened in the Miller Creek Formation or the Filled Ravine. These wells include:

¹ Field Sampling Plan (Revision 01), 2005

Miller Creek Formation Wells	Filled Ravine Wells	
MW-8	MW-1	MW-7
MW-10	MW-3	MW-9
MW-11	MW-4	TW-13
MW-16	MW-5	MW-14
MW-17	MW-6	

Groundwater will be sampled from 36 wells screened in the Copper Falls Aquifer. These wells include:

Copper Falls Aquifer Wells						
MW-2BR	MW-5C	MW-9A	MW-13D	MW-19A	MW-22A	MW-26A
MW-2C	MW-6A	MW-9B	MW-15B	MW-19B	MW-22B	MW-2A(NET)
MW-4A	MW-7A	MW-10A	MW-17A	MW-20A	MW-23A	MW-2B(NET)
MW-5A	MW-7B	MW-13B	MW-18A	MW-21A	MW-23B	AW-1
MW-5B	MW-8A	MW-13C	MW-18B	MW-21B	MW-24A	AW-2
					MW-25A	

Groundwater will be sampled from seven shallow monitoring wells located in Kreher Park and screened in fill material. These wells include:

Kreher Park Wells
MW-1 (NET)
MW-2 (NET)
MW-7R
TW-12
MW-24
MW-25
MW-26

The locations of these wells are shown on Figure 2-1. Analytical parameters for the initial Site-wide sampling event include the RI volatile and semi-volatile organic compounds (VOCs, SVOCs), metals (dissolved and total) and cyanide (Table 2-1). Hexavalent chromium will not be included in the Site-wide or subsequent sampling event since it was determined during the RI that it is not a site-related contaminant and the 24-hour holding time makes sample collection problematic. Parameters for subsequent sampling of the Copper Falls Aquifer wells will include VOCs and PAHs only.

2.3 Sample Frequency

One sampling event will be conducted for Site-wide wells. A subsequent sampling event will be conducted for the Copper Falls Aquifer wells.

To maximize sampling efficiency and minimize delays and complications due to weather, sampling events will not be conducted during the winter months. The Site-wide sampling event will be conducted in August 2008 with the subsequent Copper Falls Aquifer sampling event conducted in April 2009.

2.4 Sample Collection

All details regarding groundwater sample collection will be recorded in the field logbook. The condition of the well will also be recorded at the time of sample collection. The procedure for collecting groundwater samples is described in the attached SOP 150.

Prior to sample collection, static water levels will be measured in all site wells with a water level indicator. The procedures for using the water level indicator are described in the attached SOP 100. Additionally, all wells will be measured for presence of NAPL during the Site-wide sampling event. The procedure for measuring NAPL is described in the attached SOP 270. Samples will not be collected from wells containing more than 12-inches of NAPL. If a well contains less than 12-inches of NAPL, samples will be collected following bailing of the well. The Copper Falls Aquifer sampling event will include water level measurement prior to sample collection and measurement of NAPL thickness in all wells.

Each well will be purged with a dedicated/decontaminated bailer or submersible pump. Each well will be purged until at least four times the volume of water in the well casing has been removed. All purge water will be discharged to the site treatment system. Additionally, field measured parameters must stabilize for purging to be complete. At least three consecutive readings spaced approximately 2 minutes, or 0.5 well volumes or more apart, are required to be within the following ranges for the following indicator parameters prior to collection of samples:

- Specific Conductance $\pm 5.0 \mu\text{mhos/cm}$ for values $<1000 \mu\text{mhos/cm}$
 $\pm 10.0 \mu\text{mhos/cm}$ for values $>1000 \mu\text{mhos/cm}$
- pH ± 0.1 pH units
- Temperature ± 0.1 °C
- Dissolved Oxygen ± 0.2 mg/L

For low permeability formations, purging will continue until the well is dry. If time permits, the well will be allowed to recover completely and will be bailed dry a second time. Purge volumes and the color, odor, and turbidity of each will be noted on field sampling forms. The procedures for determining pH, specific conductance, and temperature are detailed in attached SOPs 110, 120 and 130.

2.4.1 Sample Containerization

Groundwater samples will be placed in appropriate laboratory supplied containers. Samples will be placed in containers and preserved in accordance with the analytical requirements listed in Table 2-1. Procedures for filling laboratory containers are described in attached SOP 160.

Samples submitted for dissolved analytes will be field filtered prior to placement in containers. Procedures for field filtering are described in attached SOP 170.

2.4.2 Sample Nomenclature

The sample nomenclature established in the FSP will be used for subsequent groundwater sampling events for assigning unique sample names. The unique sample name will be used for the sample containers and chain of custody. The following is an example of a sample identification number for a groundwater sample:

NS-GW-MW10-1204, for NSP site, groundwater sample from monitoring well MW-10 in December 2004

NS-WQ-DUP04-1204, for NSP site, duplicate groundwater sample # 4 in December 2004

NS-GW-MW10-1204 MS/MSD, for NSP site, replicate groundwater sample from monitoring well MW-10 in December 2004.

2.5 Sample Analysis

Sample analysis will be provided by Northern Lake Services, Crandon, Wisconsin, and a Wisconsin-certified environmental laboratory. Analytical parameters for the initial Site-wide sampling event include VOCs and SVOCs, metals (dissolved and total) and cyanide (Table 2-1). The analytical parameter list for each group of analytes (i.e. VOCs) is the same as that used for the RI groundwater sampling. However, hexavalent chromium will not be analyzed because it was determined during the RI that it is not a site-related contaminant and the 24-hour holding time makes sample collection problematic. Subsequent samples collected from the Copper Falls aquifer wells will be limited to VOCs and poly-aromatic hydrocarbon (PAH) compounds.

Analytical methods are included in Table 2-1.

2.6 Data Usage and Reporting

The August 2008 sampling event will provide current groundwater quality in support of historic monitoring results. The April 2008 Site-wide and subsequent April 2009 Copper Falls aquifer sampling event will provide information on the efficiency of the interim NAPL recovery system. Data from these sampling events will also provide groundwater quality data following completion of USEPA's chemical oxidation SITE demonstration pilot test (February 2007).

Groundwater data will be validated, reviewed, and compared to historical data. Data will be presented in tabular and graphic format as appropriate to report water levels, NAPL thickness and contaminant concentrations. A short narrative will be provided that will note any substantive changes with respect to historical data. It is anticipated the results of the groundwater sampling events will be reported within three to four weeks of completion of the sampling activities.

3.0 SAMPLE QA/QC

Procedures for collecting QA/QC samples are described in attached SOP 180. Data will be validated upon receipt from the laboratory. The analytical laboratory will provide level II QC data packages with the analytical results.

3.1 Duplicate Samples

Duplicate samples will be collected from selected groundwater sample locations at a frequency of one sample for every 10 samples submitted for laboratory analysis. Section 2.4.2 of this GSP describes the methods for assigning unique sample names. The unique sample name will be used for the sample containers and chain of custody. Samples will be placed in laboratory-supplied containers and preserved in accordance with the analytical requirements listed in Table 2-1 and in accordance with attached SOP 160. Samples submitted for dissolved analytes will be field filtered in accordance with attached SOP 170 prior to placement in containers.

3.2 Replicate Samples

Replicate samples include matrix spike and matrix spike duplicates (MS/MSD). One MS/MSD sample will be collected for every 20 samples submitted for laboratory analysis. The volume of groundwater collected at each of the locations where MS/MSD samples will be obtained will require triple the sample volume for each organic and inorganic analysis. Samples will be placed in laboratory-supplied containers and preserved in accordance with the analytical requirements listed in Table 2-1 and in accordance with attached SOP 160. Samples submitted for dissolved analytes will be field filtered in accordance with attached SOP 170 prior to placement in containers. Section 2.4.2 of this GSP describes the methods for assigning unique sample names. The unique sample name will be used for the sample containers and chain of custody.

3.3 Trip Blanks

Trip blanks will be included with each shipping container that contains groundwater samples to be analyzed for VOCs. Each trip blank will consist of one 40ml glass vial containing de-ionized water preserved with 1:1 HCl that has been prepared by the laboratory.

4.0 SAMPLE SHIPPING

Procedures for shipping environmental samples are detailed in attached SOP 210. Environmental samples will be shipped via an overnight courier service, with delivery specified for the following morning. The field manager will contact the laboratory ahead of time to inform laboratory personnel of the number of samples, analytes, courier service, and other pertinent information to ensure the integrity of sample results. Samples will be shipped in a manner to guarantee delivery to the laboratory before hold times expire. Analytes that have specific temperature requirements (i.e. 4° C) will be shipped in a cooler with ice.

Northern Lake Service, of Crandon, Wisconsin will provide analytical services. The analytical laboratory addresses and contact are as follows:

Northern Lake Service, Inc
400 North Lake Avenue
Crandon, Wisconsin 54520
Phone: (715) 478-2777
Contact: Ms. Tracy Huber

TABLE 2-1 – Groundwater Sampling Plan Summary

Sample Matrix	Location	Rounds of Sampling	Number of Wells	Field Duplicates	MS/MSD	Laboratory	Analytical Method	Sample Preservation	Sample Container	Sample Holding Time
Ground-water	Site-Wide	1	58	6	3	VOCs	EPA 8260	HCl, 4 deg. C	3 - 40 ml vials	14 Days
						SVOCs	EPA 8270C	4 deg. C	2 - 1 L amber jars	7 Days
						Cyanide	EPA 335.4	NaOH, 4 deg. C	1 - 250 ml plastic jar	14 Days
						Metals (dissolved, total)	EPA 6010B/7471A	HNO ₃ , 4 deg. C	2-125 ml plastic jar	6 Months
Ground-water	Copper Falls Aquifer	1	36	3	1	VOCs	EPA 8260	HCl, 4 deg. C	3 - 40 ml vials	14 Days
						PAHs	EPA 8270C	4 deg. C	2 - 1 L amber jars	7 Days


ATTACHMENTS

**GROUNDWATER SAMPLING
STANDARD OPERATING PROCEDURES**

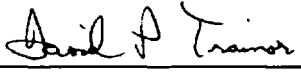
Standard Operating Procedure
For
Water Level Measurements Procedures

Prepared by: 

Date: February 1, 2005

Reviewed by: 

Date: February 1, 2005

Approved by: 

Date: February 1, 2005

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1.0 SCOPE

This operating procedure describes methods for measuring and recording manual water level measurements in wells by means of an electronic or mechanical device. Water levels may be observed with steel or fiberglass tapes by a "popper" weight, which makes a popping sound when it strikes the water surface. An electrical tape may also be used which transmits and activates a sound (BEEP) in response to its electrode contact with the water surface.

2.0 OBJECTIVES

This standard procedure is intended to:

- Assure that water levels measured at different times and by different personnel are comparable, uniform, and reliable.
- Allow traceability of errors in water level measurement, and correction of improper procedures.
- Assure the data obtained in the field are complete and of satisfactory precision and accuracy.

3.0 EQUIPMENT NEEDED

- Steel, fiberglass or electrical tape. Steel or fiberglass tapes should be graduated in feet to hundredths. Electrical tapes may be graduated only at 5-foot intervals.
- Pocket steel tape or folding ruler (graduated in feet to hundredths).
- Permanent marker for marking well with its number and marking the measure point.
- Pre-printed water-level measurement forms.
- Field notebook.
- Batteries for electrical tape.
- Clean rags or Kimwipes.
- Distilled or de-ionized water; organic-free if well is to be sampled for organics.

4.0 CALIBRATION

Prior to initial use, the water level tape should be checked against a standard steel tape with calibration traceable to the National Bureau of Standards. The calibration tape should not be used for field measurements, but only for calibrating field tapes. New field tapes will be calibrated against the standard tape before use by stretching both along a flat level surface and applying to each a tension approximately equal to the weight of the tape. For each 10 feet of distance along the standard tape, record the corresponding reading of the field tape on a Tape Calibration Record.

5.0 MEASURING POINT

The measuring point is the fixed point on the well from which all water level measurements are taken. The selected point is generally the highest point on top of the PVC casing where the well elevation has been determined.

The measuring point must be permanently marked. Usually it will be most convenient to put a spot of permanent ink on the PVC casing rim, with an arrow and the letters "MP" pointing to it.

Experience shows that considerably more error in ground water level measurements comes from mistaking the identity of a well or the location of the proper measuring point than from errors in the actual measurement. It is essential that the well and measuring point be clearly identified. If field inspector or technician notices an unmarked well, they should make sure that the well number and measuring point location are permanently marked. The well number may be painted on the outside of the casing or inside of the protective cap, as long as it is obvious to anyone opening the well for measurement.

6.0 PRELIMINARY TO OPERATION

1. Inspect tape to make sure that is complete and moves freely in its case. Make sure that popper is firmly attached and that its lower end is a convenient distance (for example, 0.50 feet) below the zero mark on the tape. Record the distance on the field log.
2. Inspect electrode tip of electric tape. Test batteries, and test operation of tape in the laboratory by placing electrode in tap water and making sure that the meter or other indicator responds. Make sure that the effective position of the electrode corresponds to the zero position on the tape. If the electrode has been repaired or replaced, the zero position may have been affected. Note any discrepancy in the field notes and notify the laboratory manager.

7.0 CLEANING

Instruments used for water level measurements will be decontaminated between each monitoring well in accordance with SOP 190.

8.0 MEASUREMENT METHODS

Two measurement methods are described.

- Measurement with popper. A popper should only be used in wells with suspected NAPL that may interfere with operation of an electric tape. SOP 270 discusses measuring NAPL present in monitoring wells.
- Measurement with electric tape. Use of appropriate method should be determined based on the existing conditions and upon discussions with the project hydrogeologist and Quality Assurance Officer.

All water level measurements in a particular sampling round should be made using the same electric meter.

8.1 Measurement with Popper

1. This method is simple, fast, and fairly accurate. Precision is approximately ± 0.02 feet, but may be less under unfavorable conditions. Accuracy depends on the tape used. Occasionally, conditions in the well or outside noise will make it impossible to hear the popper, and measurements with electric tape should be employed.
2. Lower the tape into the well until the hollow-bottomed weight strike the water surface and causes a popping sound. Hold the tape near the measuring point, and raise and lower several times to determine the water surface as closely as possible.
3. Record the actual number of feet that appears opposite the measuring point, i.e., do not add the "popper correction"--the distance from the tape zero mark to the bottom of the popper--before recording the number. Read the tape to the nearest ± 0.01 feet. Record the popper correction on the field log and add to the measured water depth.

8.2 Measurement with Electrical Tape

1. This method is preferred over using popper methods. Its precision may be limited by uncertainties in interpreting the sensing meter. Accuracy may be as low in measuring deep wells because of tape stretching. This method should be used with caution if high accuracy is important, for example in pumping tests. It may be preferred, however, in deep wells or in water table wells where other methods are not feasible, or in noisy situations.
2. Turn on the electrical water sensor. Lower the tape into the well until it produces a beep or other response. Raise and lower the tape a few times to confirm that the water level has been detected.
3. Once the water level is detected, note the value on the measuring tape at the mark noted on the top of the well casing. If the well casing does not have a mark, note the value on the measuring tape along the northern edge of the well casing.
4. Record the measured value in the field logbook or well sampling form.
5. Decontaminate the electrical tape in accordance with SOP 190.

9.0 RECORD KEEPING

Whenever possible, use pre-printed forms, since these will minimize the risk of missing some important information. If taking notes in a field log, however, the following should be recorded:

- Well number and location. All too often a single well is assigned two or more different numbers; if at all possible, record them all to avoid confusion for future users of the records.
- Date and time of measurement.
- Field observer's name.
- Serial number of tape used.
- Measuring point description, including whenever possible its sea level elevation, stickup (the distance from the ground surface to the measuring point). Be sure to note whether the measuring point is above or below ground surface.
- Method of measurement.
- Tape readings.
- Factors that may influence the water level -- for example, recent pumping of the well or nearby wells.
- Damage or alterations to the well or settlement that may have occurred since the last measurement.

As soon as possible, the measurements should be reduced in the office to elevation above sea level for long-term data storage. This is important because alteration or damage to wells changes the measuring point elevation, so that measurements of depth to water before and after this change are not comparable. The resulting confusion is difficult to sort out.

10.0 WELL SURVEY

During a well survey, the surveyor should obtain elevations of both the measuring point and the ground surface. If a concrete pad surrounds a well, surveyor should also permanently mark a spot on the pad and determine its elevation. This allows easy determination of a new measuring point elevation if the well is damaged or modified.

Standard Operating Procedure

For

Groundwater Field Parameter Measurement

Prepared by: 

Date: February 1, 2005

Reviewed by: 

Date: February 1, 2005

Approved by: 

Date: February 1, 2005

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Attachments**Form 110-A Instrument Calibration Log**

1.0 SCOPE

This operating procedure describes the operation, calibration, and maintenance of a water quality meter and its accessories for use in the field. Manufacturer's specifications and recommendations should be followed or referred to as and when need arises.

2.0 OBJECTIVES

The activities covered by this procedure:

- Insure quality control in field pH measurement.
- Insure uniformity and continuity in operation, calibration, and maintenance of both the equipment and measuring techniques by different qualified field analysts or technicians.

3.0 EQUIPMENT NEEDED

- Water quality meter and its accompanying electrode or probe*;
- Buffer solutions of known pH (4.0, 7.0, and 10.0);
- Calibration standard for conductivity (1409 μ S);
- Plastic or glass beakers or cups;
- Flow-through cell and tubing (if specified in work plan);
- Distilled or de-ionized water;
- Polyethylene spray bottle;
- Waterproof marking pen or pencil;
- Liquid waste container;
- Lint free paper towels;
- Trash receptacle; and
- User's manual for water quality meter.

* The water quality meter should be a YSI 556 MPS or equivalent.

4.0 PRELIMINARY TO OPERATION

At the start of each field day, the water quality meter should be examined for cleanliness, and checked for defects, and any possible need of repair. The checks should include whether the battery and electrode are operable. The meter should also be calibrated at the start of each day, with intermittent calibration checks throughout the day to determine whether recalibration is necessary. The following procedures should be performed at the start of each field day:

- **Battery check** to determine if battery is functional to full scale. Batteries are replaced if found weak.

- **Electrode check** in accordance with the user's manual from the manufacturer. If the electrode check indicates potential problems with the electrode, a different electrode and/or water quality meter must be obtained or the electrode must be repaired before going into the field.
- **Meter calibration** in accordance with the user's manual from the manufacturer. Calibration schedule should include daily calibration, and intermittently, when required, during continuous use of the meter.

Calibrate the water quality meter in accordance with the user's manual provided by the manufacturer. Calibration for specific conductivity meter should be made with a standard of approximately the same conductivity as those expected at the site, and should be measured at (or converted to) 25°C. Some conductivity meters automatically compensate for temperature, some compensate after the user adjusts a temperature knob on the meter to the measured temperature, and others have no temperature compensation feature. Refer to the user's manual to determine what temperature compensation features the conductivity meter has and follow the directions. The calibration of the field instruments must be checked every four hours and at the end of the day. If the calibration check is not within $\pm 5\%$ of the expected value, the meter must be recalibrated. Record calibration information in the field logbook or on an instrument calibration data sheet.

Instrument calibration for pH consists of calibration of the water quality meter with pH 7 and pH 10 buffers, and a pH 4 buffer as a check, or with pH 7 and pH 4 buffers, and a pH 10 buffer as a check, depending on the average expected pH values of the samples.

The calibration for pH is temperature correlated. Please note the **actual** pH of your buffers at the temperature used for calibration. (A chart for this is usually provided on the buffer container.) If the pH meter does not have automatic temperature compensation, you may need to calibrate the 7 buffer to 6.95 or 7.03, or some point in between, depending on the temperature of your buffers. Some water quality meters compensate for temperature, but require the user to set a temperature knob on the meter to the measured value. Refer to the user's manual to determine what temperature compensation features the meter has, if any, and follow the meter-specific instructions.

Calibration should be accomplished through the following steps:

1. Place the electrode in the pH 7 buffer solution and adjust the meter to read 7.0, or the appropriate value given on the buffer container.
2. Rinse the electrode with de-ionized water.
3. Place the electrode in the pH 4 or pH 10 buffer and adjust the meter slope until the meter reads the appropriate value.
4. Rinse the electrode with de-ionized water.

5. Place the electrode in the pH 4 or pH 10 buffer, whichever was not used in Step 3, and read the pH of the check buffer. If the value is not within 0.1 pH unit of the expected value, repeat the calibration procedure. If the meter cannot be successfully calibrated on several successive attempts, another meter should be used or the meter should be repaired prior to use.
 6. Record calibration information in the field logbook or on a calibration data sheet. Note any problems encountered during calibration.
- **Scheduled maintenance** will include daily checks by URS trained personnel according to procedures provided by the equipment's manufacturer.
 - **Repairs** and scheduled service will be performed by an authorized service representative. Scheduled service will be completed in accordance with the manufacturers specifications.

5.0 OPERATING PROCEDURE

1. Turn on power and allow meter to stabilize for about three to five minutes. Caution: Do not leave or use meter in direct sunlight or cold wind.
2. Place water sample in beaker or cup. If using a flow-through cell with a pump, connect pump tubing to cell and attach discharge tubing to cell. Discharged water should be handled in accordance with the Investigative Derived Waste management plan.
3. Insert electrode into sample and gently stir. If using a flow through cell, connect electrode to cell and turn on pump. Allow a minimum of 30 seconds for readings to stabilize.
3. Once readings have stabilized, record the pH reading, specific conductivity, dissolved oxygen content, and sample temperature in the field logbook or on a data sheet.
4. Obtain one duplicate field measurement for every 20 measurements performed. Initial measurement and duplicate measurement should be within 20 percent.
5. Once groundwater field parameter measurements are completed, remove electrode from sample and rinse with deionized water. Dispose of sample in accordance with the Investigative Derived Waste management plan.

FORM 110-A**INSTRUMENT CALIBRATION LOG**

INSTRUMENT:	
MANUFACTURER:	
MODEL NUMBER:	
SERIAL NUMBER:	
URS ASSET NUMBER:	
DATE ACQUIRED OR SERVICED:	
ORIGINAL OR PREVIOUS CALIBRATION DATE:	
CALIBRATED BY:	
NOTES ON ORIGINAL OR PREVIOUS CALIBRATION:	
CALIBRATION SCHEDULE: (circle one) DAILY MONTHLY YEARLY	
MAINTENANCE SCHEDULE: (circle one) DAILY MONTHLY YEARLY	
CURRENT CALIBRATION RECORD:	
DATE:	TIME:
CALIBRATION STANDARD(S) USED:	
CONCENTRATION(S):	
PROCEDURE (describe briefly):	
DEFICIENCIES: (if any):	
CALIBRATION PLOTS OR GRAPHS (attach, if any)	
SIGNATURES:	
Name:	Date:

Standard Operating Procedure

For

Conductivity Measurement

Prepared by: _____

Date: _____

Reviewed by: _____

Date: _____

Approved by: _____

Date: _____

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Attachments**Form 120-A Instrument Calibration Log**

1.0 SCOPE

This procedure describes the operation, calibration, and maintenance of conductivity meters for use in the field sampling activities. Manufacturer's specifications and recommendations for the specific conductivity meter used should also be followed. Project-specific quality assurance objectives may indicate calibration schedules and/or criteria which override those provided in the SOP.

2.0 OBJECTIVES

The activities covered by this procedure:

- Insure quality control in field conductivity measurement.
- Insure uniformity and continuity in operation, calibration, and maintenance of both the equipment and measuring techniques by different qualified field analysts or technicians.
- Provide semi-quantitative data for use in determining relative variations in conductivity between two or more water (surface water and/or groundwater) samples.
- Indirectly serve as a means to evaluate the water quality at the time of sampling. It is imperative that temperature compensation is made because conductivity measurements are very sensitive to the temperature of the solution being measured.

3.0 EQUIPMENT NEEDED

- Conductivity meter^a.
- Reference solutions.
- Thermometer.
- Plastic cup or beaker (at least 20 mL volume).
- Distilled water.
- Polyethylene wash bottle.
- Trash receptacle.
- User's manual for conductivity meter.

^a Portable conductivity meters available with URS for use in field include:

- Myron L pDS Meter - Model EP11/pH;
- CSI pH/Temperature/Conductivity Tester - Catalog No. 301353;
- Omega pH and Conductivity Pens; and
- Extech Conductivity and Temperature Meter.

4.0 PRELIMINARY TO OPERATION

1. Examine the conductivity meter for cleanliness, defects, and any possible need of repair. Check the battery and conductivity probe or cell for proper function.

2. Calibrate the conductivity meter in accordance with the user's manual provided by the manufacturer. Calibration of the specific conductivity meter should be made with a standard of approximately the same conductivity as those expected at the site, and should be measured at (or converted to) 25°C. Some conductivity meters automatically compensate for temperature, some compensate after the user adjusts a temperature knob on the meter to the measured temperature, and others have no temperature compensation feature. Refer to the user's manual to determine what temperature compensation features the conductivity meter has and follow the directions. The calibration of the field instruments must be checked every four hours and at the end of the day. If the calibration check is not within $\pm 5\%$ of the expected value, the meter must be recalibrated.

Record calibration information in the field logbook or on an instrument calibration data sheet.

3. Scheduled maintenance will include daily checks by URS trained personnel according to procedures provided by the equipment's manufacturer.
4. Repairs will be performed by authorized service representative.

5.0 OPERATING PROCEDURE

1. Measure conductivity and temperature of sample following manufacturer's instructions.
2. Remove probe from sample solution and rinse it thoroughly in de-ionized water before proceeding to measure next samples or putting away the equipment.
3. Record data in field logbook or on data sheets.
4. Obtain one duplicate field measurement for every 20 measurements performed. Initial measurement and duplicate measurement should be within 20 percent.

**FORM 120-A****INSTRUMENT CALIBRATION LOG**

INSTRUMENT:	
MANUFACTURER:	
MODEL NUMBER:	
SERIAL NUMBER:	
URS ASSET NUMBER:	
DATE ACQUIRED OR SERVICED:	
ORIGINAL OR PREVIOUS CALIBRATION DATE:	
CALIBRATED BY:	
NOTES ON ORIGINAL OR PREVIOUS CALIBRATION:	
CALIBRATION SCHEDULE: (circle one) DAILY MONTHLY YEARLY	
MAINTENANCE SCHEDULE: (circle one) DAILY MONTHLY YEARLY	
CURRENT CALIBRATION RECORD:	
DATE:	TIME:
CALIBRATION STANDARD(S) USED:	
CONCENTRATION(S):	
PROCEDURE (describe briefly):	
DEFICIENCIES: (if any):	
CALIBRATION PLOTS OR GRAPHS (attach, if any)	
SIGNATURES:	

Standard Operating Procedure
For
Temperature Measurement

Prepared by: _____

Date: _____

Reviewed by: _____

Date: _____

Approved by: _____

Date: _____

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5.2 Bulb Thermometers	4

1.0 SCOPE

This operating procedure describes the operation, calibration, and maintenance of a thermometer and its accessories for use in the field. Manufacturer's specifications and recommendations for the specific thermometer used should also be followed.

2.0 OBJECTIVES

The activities covered by this procedure:

- Insure quality control in field temperature measurement.
- Insure uniformity and continuity in operation, calibration, and maintenance of both the equipment and measuring techniques by different qualified field analysts or technicians.
- Provide an accurate means of compensating pH and conductivity measurements to standard conditions.

3.0 EQUIPMENT NEEDED

- Thermometer^a with mercury bulb, or probe in modern meters.
- Field log.
- Sample container.

^a Thermometers available with URS for use in the field, such as:

- Temperature Indicator MyCal Model SA-754-B;
- CSI pH/Temperature/Conductivity Tester - Catalog No. 301353;
- Extech Conductivity and Temperature Meter; and
- Oakton pH/Conductivity/TDS/Temperature Meter, Model PC 300.

4.0 PRELIMINARY TO OPERATION

1. Check the thermometer for accuracy before each sampling event against an NBS calibrated thermometer.
2. Record the calibration check in the field logbook or on data sheets.
3. For electronic temperature meters, check the battery.

5.0 OPERATING PROCEDURE**5.1 Temperature Meters**

1. Turn the meter on.
2. Plug the jacks on the probe into the thermometer.
3. Lower the probe into the sample and record measured temperature in field logbook or on the sampling data sheet.
4. Decontaminate probe when finished.
5. Obtain one duplicate field measurement for every 20 measurements performed. Initial measurement and duplicate measurement should be within 20 percent.

5.2 Bulb Thermometers

1. Lower bulb into sample and allow to equilibrate.
2. Record measured temperature in field logbook or on sampling data sheet.
3. Decontaminate thermometer when finished.
4. Obtain one duplicate field measurement for every 20 measurements performed. Initial measurement and duplicate measurement should be within 20 percent.

Standard Operating Procedure

For

Groundwater Sample Collection

Prepared by: Brian White

Date: February 1, 2005

Reviewed by: Mark L. McCloskey

Date: February 1, 2005

Approved by: David J. Trainor

Date: February 1, 2005

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Attachments**FORM 150-A Groundwater Sampling Record**

1.0 SCOPE

This operating procedure describes steps involved in well purging and preparation for taking groundwater samples using a bailer and its accessory equipment. Dedicated sampling equipment is to be used whenever possible to prevent cross-contamination between sampling points. Manufacturer's specifications and recommendations for all equipment should be followed.

2.0 OBJECTIVES

The activities covered by this procedure:

- Insure that the groundwater samples taken will be representative of actual groundwater quality.
- Insure quality control and consistency in taking samples.
- Serve as a means to allow traceability of error(s) in sampling and data recording.

3.0 EQUIPMENT NEEDED

- Well keys;
- Waterproof and permanent marker;
- Field notebook and sample collection forms;
- Sample jars and labels;
- Bailer constructed of Teflon®, stainless steel, or PVC pipe;
- Nylon rope;
- Bulk storage tank or drum for storing purged water;
- Appropriate health and safety equipment;
- 12 volt submersible whale pump;
- A tarp or plastic sheet to cover ground and to lay bailer, line, reel, and water level tape;
- Water quality Meter;
- Calculator;
- Appropriate decontamination equipment;
- A water level measuring tape; and
- Spare batteries for field instruments.

4.0 PRELIMINARY TO OPERATION

1. Review project work plan for site-specific sampling requirements and procedures.
2. The bailer, reel, line, water level measuring tape, thermometer, pH and conductivity meters should be cleaned, checked for defects, and any possible need for repair.
3. Batteries should be checked in the water quality meter (SOP 110) and calculator.
4. A decontaminated tarp or plastic sheet should be placed on the ground for the bailer, reel, line, water level measuring tape and other equipment to be placed.

5.0 OPERATING PROCEDURE

Procedures for collecting groundwater samples from monitoring wells are as follows:

1. Place tarp around well by cutting a slit in the tarp and lowering it around the protective casing.
2. Record the well number, time, and date and all pertinent information and data on groundwater sampling record, or other data sheet or field logbook.
3. Identify measuring point, marked on well casing. Following the procedures outlined in SOP 100, measure the depth to groundwater in the well to the nearest 0.01 foot with water level tape. Measure depth to the bottom of the well to the nearest 0.01 foot with a weighted tape. Enter these data on the groundwater sampling record. Decontaminate the water level tape and weighted tape measure following water level measurement.
4. Calculate the volume of water in the well using the equation:

$$Volume (gallons) = \pi \times H \times \left(\frac{D}{24} \right)^2 \times \frac{7.48 \text{ gal}}{ft^3}$$

Where: H = Depth of Well minus Depth to Water (feet); and
 D = Inside diameter of well (inches).

5. If a bailer is used for well purging, lower the bailer in the well to just below the water level and retrieve when filled.
6. If a pump is used for well purging, lower pump or intake into the well to a distance just below the water level and begin water removal. Measure rate of discharge frequently to ensure required volume is removed.
7. Place purge water in bulk storage container for disposal. Purge water should be disposed of in accordance with the Investigative Derived Waste management plan.
8. Continue purging the well until at least four times the volume calculated in Step No. 4 has been removed. For low permeability formations, continue purging until the well is dry. If purged dry, allow the well to recover completely and purge dry a second time. Record the actual volume of water purged and note whether the well was bailed dry on the sampling record or in the field logbook.
9. Allow water level to recover sufficiently so that an adequate volume of water for the intended analyses is present. It is not necessary for the water level to return to its original level.
10. Remove one bail of water from the well and record its temperature, pH, conductivity, and dissolved oxygen content. Record the measurements and the time.

-
11. Begin removing sample bails with the bailer and line. Use the first bail for VOC analysis and pour into bottle using care not to stir and allowing air bubbles to escape. Use last bail for metals analysis. Filter groundwater samples per SOP 170 for dissolved metals analyses. Required sample containers and preservative requirements are discussed in the project work plan. Between removing bails, do not lay bailer or line on the ground unless it is covered with a new or decontaminated tarp or plastic sheet.
 12. Affix labels to each sample bottle recording sample number, well number, date, and time. Place clear tape over the label and secure the lid of the sample container with shipping tape.
 13. Record sample information on sampling record or in field log, along with a description of the physical appearance of the sample, including color, odor, and turbidity.
 14. Place samples immediately in a shipping container maintained at 4°C.
 15. Decontaminate electric water level tape, as described in SOP 190.

GROUNDWATER SAMPLE COLLECTION

October 15, 2004

Page 6 of 6

FORM 150A

GROUNDWATER SAMPLING RECORD

SITE NAME Ashland/NSP Lakefront Site WELL NO. _____
 PROJECT NO. 25688375.60000 SAMPLERS. _____
 DATE _____ PURGE TIME: _____

WATER LEVEL OBSERVATIONS

WELL DIAMETER 2-in DEPTH OF WELL _____
 TOC ELEVATION _____ DEPTH OF WATER _____
 GW ELEV. _____ WATER COLUMN _____

PURGING

WELL DIA. 2" VOLUME 0.163 gal/ft PURGING METHOD _____

WATER QUALITY		WELL CONDITION	
COLOR		LOCK	
ODOR		CAP	
TURBIDITY		PROTOP	

BAILER

PUMP

INFORMATION

PURGE VOLUME _____ PURGED DRY? _____
 TO PURGE _____ gallons FLOW RATE? _____
 ACT PURGED _____ gallons DTW AFTER PURGING _____
 PROBLEMS _____

FIELD PARAMETERS

TIME/GALLONS				
pH				
CONDUCTIVITY				
TEMPERATURE				
DISS OXYGEN				
TURBIDITY				

ANALYSIS INFORMATION

VOLUME/CONTAINER	ANALYSIS / PRESERVATIVE	FILTERED	TIME
3 - 40 ml vials	VOC 8260B / HCl	no	
2 - 1 L amber	SVOC 8270C / none	no	
1 - 250 ml plastic	Tot. Cr / NaOH	no	
1 - 250 ml plastic	Tot. Metals / HNO3	no	
1 - 250 ml plastic	Diss. Metals / HNO3	yes	
1 - 250 ml plastic	Chromium (+6) / none	yes	

NOTES

FORM 150A

GROUNDWATER SAMPLING RECORD

SITE NAME: Ashland/NSP Lakefront Site
 PROJECT NO.: 25688375.60000
 DATE: _____

WELL NO.: _____
 SAMPLERS: _____
 PURGE TIME: _____

WATER LEVEL OBSERVATIONS

WELL DIAMETER: 2-in.
 TOC ELEVATION: _____
 GW ELEV.: _____

DEPTH OF WELL: _____
 DEPTH OF WATER: _____
 WATER COLUMN: _____

PURGING

WELL DIA. 2"
VOLUME 0.163 gal./ft.

PURGING METHOD

BAILER

PUMP

WATER QUALITY		WELL CONDITION	
COLOR		LOCK	
ODOR		CAP	
TURBIDITY		PROTOP	

INFORMATION

PURGE VOLUME
 TO PURGE: _____ gallons
 ACT. PURGED: _____ gallons

PURGED DRY? _____
 FLOW RATE? _____
 DTW AFTER PURGING _____
 PROBLEMS _____

FIELD PARAMETERS

TIME/GALLONS				
pH				
CONDUCTIVITY				
TEMPERATURE				
DISS. OXYGEN				
TURBIDITY				

SAMPLING INFORMATION

VOLUME/CONTAINER	ANALYSIS / PRESERVATIVE	FILTERED	TIME
3 - 40 ml vials	VOC 8260B / HCl	no	
2 - 1 L amber	SVOC 8270C/ none	no	
1 - 250 ml plastic	Tot. Cn / NaOH	no	
1 - 250 ml plastic	Tot. Metals / HNO3	no	
1 - 250 ml plastic	Diss. Metals / HNO3	yes	
1 - 250 ml plastic	Chromium (+6) / none	yes	

COMMENTS

Standard Operating Procedure
For
VOC, SVOC, and Inorganic Sample Collection

Prepared by: _____

Date: _____

Reviewed by: _____

Date: _____

Approved by: _____

Date: _____

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1.0 SCOPE

This procedure describes the methods that will be used to collect soil and groundwater samples for VOCs, SVOCs, and inorganic compounds.

2.0 OBJECTIVES

The activities covered by this procedure:

- Insure quality control in field sampling for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganic compounds (cyanide and total metals).
- Insure uniformity and continuity in sampling techniques and use of the equipment by different qualified field samplers or technicians.
- Serve as a means to allow traceability of error(s) in sampling.

3.0 EQUIPMENT NEEDED

- Laboratory supplied sample containers;
- Labels;
- Scale;
- Spatula;
- Distilled or de-ionized water;
- Paper towels; and
- Waterproof marking pen or pencil.

4.0 OPERATING PROCEDURE

4.1 Water Samples

Water and surface water sample collection for VOC, SVOCs, and inorganic compounds consists of the following steps:

1. Fill VOC vials first. Remove cap of vial just prior to sampling.
2. Hold cap in same hand as the bottle.
3. For VOC water samples, tilt vial slightly into water and fill slowly to minimize the turbulence and aeration. Bailer bottom emptying device is recommended.
4. For VOC water samples, fill vial to overflow insuring that a positive meniscus is formed. Place cap on top of septum and quickly screw it on tightly.
5. If bubbles are present in VOC water samples, discard the sample and begin over with a new set of vials. If no bubbles are present, label and mark it with project number, description, sample number, sampler's initials, date and time of sampling, etc., with a waterproof marker.

-
6. For SVOCs and inorganic compound samples, remove lids of laboratory supplied bottles just prior to sample collection.
 7. Tilt bottle into water and fill slowly to minimize the turbulence and aeration. Bailer bottom emptying device is recommended. Follow procedures in SOP 170 for field filtering. Place lid on bottle. Label and mark it with project number, description, sample number, sampler's initials, date and time of sampling, etc., with a waterproof marker.
 8. Wash outside of vials and bottles with distilled or organic free water and wipe clean with a paper towel.
 9. Store in ice-packed sample container and ship with a chain-of-custody record.

4.2 Soil Samples

Soil sample collection for VOC, SVOCs, and inorganic compounds consists of the following steps:

1. Fill VOC jars first. Remove cap of vial just prior to sampling. Place jar on field scale to obtain tare weight.
2. Place 25 to 35 grams of soil in VOC jar using spatula as needed. The weight of the soil added to the jar will be recorded in the field notes and on the sample label.
3. Add 25 mL of methanol to preserve sample. Place lid on bottle. Label and mark it with project number, description, sample number, sampler's initials, date and time of sampling, etc., with a waterproof marker.
4. For SVOC and inorganic compound samples, remove lids of plastic or glass laboratory supplied bottles just prior to sample collection.
5. Fill bottle with soil (zero head space). Place lid on bottle. Label and mark it with project number, description, sample number, sampler's initials, date and time of sampling, etc., with a waterproof marker.
6. Wash outside of vials and bottles with distilled or organic free water and wipe clean with a paper towel.
7. Store in ice-packed sample container and ship with a chain-of-custody record.

Standard Operating Procedure
For
Field Filtering Groundwater Samples

Prepared by: _____

Date: _____

Reviewed by: _____

Date: _____

Approved by: _____

Date: _____

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4.0 PROCEDURE	3

1.0 SCOPE

This procedure describes the methods for filtering suspended particulates from groundwater samples for metals analyses.

2.0 OBJECTIVES

The activities covered by this procedure:

- Insure quality control in filtering of groundwater samples for analysis of dissolved metals.
- Insure uniformity and continuity in sampling techniques and use of the equipment by different qualified field samplers or technicians.
- Serve as a means to allow traceability of error(s) in sampling.

3.0 EQUIPMENT NEEDED

- Field Notebook;
- Peristaltic pump and tubing;
- Disposable 0.45 micron in-line filter;
- Transfer bottle;
- Labels and sample bottles;
- Distilled or de-ionized water; and
- Waterproof marking pen or pencil.

4.0 PROCEDURE

Field filtering groundwater for metals analysis will consist of the following steps:

1. Inspect filtering equipment and filters for cleanliness and defects, and need for repair.
2. Obtain groundwater sample and fill a decontaminated transfer bottle or container.
3. Using peristaltic pump, pump water from transfer bottle through the in-line 0.045 micron filter, and discharge to laboratory supplied container.
4. Filter groundwater samples within 15 minutes of sample collection.
5. If filter becomes clogged, replace filter.
6. Record sample information of laboratory chain of custody.

Standard Operating Procedure

For

Quality Control Sampling

Prepared by: Brian White

Date: February 1, 2005

Reviewed by: Mark & M. Colburn

Date: February 1, 2005

Approved by: David P. Trainor

Date: February 1, 2005

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1.0 SCOPE

This Standard operating procedure (SOP) describes the type and quantity of Quality Control (QC) samples to be collected for most field sampling operations. QC samples are those samples (usually collected in the field) that are sent to the laboratory along with the environmental samples in order to evaluate site conditions and laboratory precision and accuracy. Evaluation of the results from the QC samples allows for the quality of the data to be assessed. There are five different types of QC samples: trip blanks, equipment rinsate blanks, field blanks, duplicates and matrix spike/matrix spike duplicate (MS/MSD) samples. The first three types of QC samples are used to assess field conditions during sampling and/or transport of the environmental samples. The latter two types of QC samples are used by the laboratory to help assess precision and accuracy. (The laboratory also has other internal samples and procedures to assess precision and accuracy.)

Depending on the Level of data quality required by the project, different amounts of QC samples are collected. These are described in detail below.

2.0 OBJECTIVES

- Insure quality control in field sampling operations.
- Serve as a means to detect contamination that may result from sampling procedures.
- Provide documentation of equipment decontamination procedures.

3.0 DEFINITIONS

Trip Blank - Trip blanks are 40-ml volatile organic analysis (VOA) vials of ASTM Type II water that are filled at the laboratory, transported to the sampling site, and returned to the laboratory with environmental VOA samples. Trip blanks are not opened in the field.

Equipment Rinsates - Equipment rinsates are samples of ASTM Type II water (provided by the laboratory) passed over decontaminated sampling equipment. They are used as a measure of the effectiveness of the decontamination procedure. The rinsate is analyzed for the same parameters as the environmental samples collected from the piece of equipment.

Field Blanks - Field blanks are samples of source water used for decontamination and steam cleaning. At a minimum there is one sample collected for each source of water used per sampling event. The field blank is analyzed for all the parameters tested during the sampling event.

Duplicates - Duplicates are collected to help assess laboratory reproducibility (precision). Solid matrix samples are homogenized before being split, except for VOAs, which are not homogenized because of potential volatile loss. Liquid matrix samples are collected simultaneously. For both solid and liquid matrices, double the normal volume is required. The same analyses are completed on the duplicate as on the environmental sample.

MS/MSD - MS/MSD samples are used by the laboratory (but collected in the field) to help determine both precision and accuracy of analysis. For liquid matrices, triple the volume of sample is required (that is, one volume for the environmental sample, one volume for the MS sample, and one volume for the MSD sample). For solid matrices, additional volume is usually not required (although this will depend upon the laboratory).

4.0 RESPONSIBILITIES

The Project Manager is responsible for estimating the number of QC samples required for any sampling event. The procedures for determining the number is described in Section 5.0 below. The Field Manager is responsible for making sure that the sampling team(s) are collecting the required number of QC samples. The Field Team member(s) are responsible for understanding the rationale and methods for QC sample collection and for coordinating QC sample collection as appropriate.

5.0 PROCEDURES

The procedures for QC sample collection and the frequency at which each type of sample should be collected is described below.

5.1 Trip Blanks

Trip blanks (one pair of 40 ml vials) are sent to the laboratory in each cooler which contains samples for volatile organic analyses. The trip blank should also be kept in the field, with the volatile samples, during the period of sample collection. Analyses of the trip blank will determine if the sample containers were contaminated prior to sampling or during transport.

5.2 Equipment Rinsates

Equipment rinsates are collected by pouring analyte-free water (provided by the laboratory) over decontaminated sampling equipment and collecting the rinsate. These are collected at a frequency of once per day and are analyzed for the same parameters as are the samples collected from that equipment. If two (or more) different types of equipment are used to collect samples in the same day (say by two field teams, one collecting soil samples from split spoons and one collecting groundwater from bailers), then two separate rinsate samples may be collected. The rinsate blank is used to qualify data.

5.3 Field Blanks

One field blank per source of water used for decontamination per sampling event is collected for all the parameters analyzed during that sampling event. In general, two field blanks are collected - one from the potable water source used for steam cleaning and one from distilled water purchased at a local store for use in general decontamination. The field blank is collected by opening up the water source at the sampling locations and pouring the water directly into the appropriate sample bottles. Analysis of the sample will indicate whether contamination was introduced into the samples during the collection process.

5.4 Duplicates

Field duplicates are collected at a frequency of 10 percent (one duplicate or per 10 samples). The samples are split as described above and in other SOPs related to sample collection procedures (SOP 150 and SOP 160). Field duplicates are primarily used to check the precision and consistency of the sampling procedures used and as a check of laboratory accuracy.

5.5 MS/MSD

MS/MSD samples are collected in the same manner as for a duplicate sample, except that triple the volume is required for analysis (for liquids). Additional volume may be required by the laboratory for solid samples and should be verified with the lab prior to sample collection. The frequency of collection is one MS/MSD pair (or two additional sample volumes) for each 20 environmental samples collected of similar matrix (e.g. groundwater, surface water, soil). The number of MS/MSD samples to collect is determined as follows: 1-20 environmental samples, one MS/MSD pair; 21-40 environmental samples, two MS/MSD pairs, etc.

6.0 SAMPLE COLLECTION RECORDS AND EVALUATION

Records of collection of QC samples are kept in the field logbooks and on the Chain-of-Custody forms. Evaluation of the results from the QC samples is performed by the laboratory and through data validation for the MS/MSD samples. Results of the other QC samples are compared to analytical results from the sampling event to determine if any field procedures, or sample transportation/handling may have adversely affected the concentrations found in the environmental samples.

7.0 REFERENCES

Hazardous Waste Remedial Actions Program, 1990. Requirements for Quality Control of Analytical Data. DOE/HWP-65/R1, US Department of Energy, Oak Ridge, Tennessee.

Naval Energy and Environmental Support Activity, 1998. Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program. NEESA 20.2-047B, Port Hueneme, California.

USEPA, 1988. User's Guide to the Contract Laboratory Program. 9240.0-1, Office of Emergency and Remedial Response, Washington, D.C.

USEPA, 1990. Quality Assurance/Quality Control Guidance for Removal Activities - Sampling QA/QC Plan and Data Validation Procedures (Interim Final). EPA/540/G-90/004, Office of Emergency and Remedial Response, Washington, D.C.

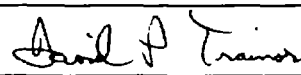
Standard Operating Procedure
For
Decontamination of Sampling Equipment

Prepared by: 

Date: February 1, 2005

Reviewed by: 

Date: February 1, 2005

Approved by: 

Date: February 1, 2005

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1.0 SCOPE

This operating procedure describes procedures used to decontaminate equipment used during environmental sampling of hazardous waste sites. Project-specific quality assurance objectives, provided in the project work plan and/or quality assurance plan, may override some of the procedure specified in the SOP.

2.0 OBJECTIVES

- Prevent cross-contamination between samples.
- Insure quality control in decontamination of field equipment used in sampling and handling environmental samples.
- Help to maintain a clean working environment for the safety of field personnel.
- Serve as a means to allow traceability of errors in procedures.

3.0 EQUIPMENT NEEDED

- Tap water and distilled water or de-ionized water;
- PPE as specified in the HSP;
- Five-gallon stainless steel pail and plastic bucket;
- Detergent (Alconox or Simple Green);
- Nylon scrub brush and long handled bottle brush;
- Aluminum foil and paper towels; and
- Trash receptacle.

4.0 PROCEDURE

1. Select an area of the site removed from sampling locations. If it can be determined, the area should be down gradient from wells being sampled.
2. Fill a 5-gallon pressurized sprayer or smaller squirt bottle with distilled water.
3. Wash all grit, grime, mud, particulates, etc.. from the equipment being decontaminated with tap water and collect in a plastic bucket.
4. For equipment visibly contaminated with NAPL, use of a detergent such as Simple Green is recommended. In a bucket, wet the surface of the equipment with tap water and apply a 1:1 dilution of Simple Green to the affected area. Then, use a brush to break up NAPL deposits. Rinse with tap water to remove residual detergent. Proceed to step 5.
5. Put one gallon of distilled water into a 5-gallon stainless steel pail and add 1-cup of Alconox.

6. Wash equipment in the pail using a nylon scrub brush or long handled bottle brush.
7. Rinse all residual detergent from the equipment with the sprayer and collect rinsate.
8. Repeat steps 5 and 6 as necessary.
9. Rinse the equipment thoroughly with organic free distilled water and collect the fluid in a plastic bucket.
10. Dry and then wrap the equipment securely in aluminum foil or polyethylene sheeting.
11. Dispose of soiled materials and fluids in designated disposal containers in accordance with the Investigative Derived Waste management plan. Use of a solvent rinse is not recommended because of safety and disposal concerns.

Standard Operating Procedure
For
Shipping Environmental Samples

Prepared by: Brian White

Date: February 1, 2005

Reviewed by: Mark L. McCloskey

Date: February 1, 2005

Approved by: David P. Trainor

Date: February 1, 2005

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1.0 SCOPE

This standard operating procedure (SOP) describes the steps for shipping environmental samples for laboratory analysis. The procedures outlined in this SOP should ensure that shipping activities comply with DOT regulations (49 CFR 173 to 177) and the International Air Transportation Association (IATA).

2.0 OBJECTIVES

- Ensure that collected samples are securely delivered to analytical laboratories.
- Use consistent methods that minimize the potential for shipping errors that could threaten sample integrity.
- Serve as a means to allow traceability of error(s) in sampling and data recording.

3.0 EQUIPMENT NEEDED

- Cooler
- Waterproof and permanent marker;
- Ball point pen;
- Clear plastic tape;
- Strapping Tape;
- Scissors;
- Ice;
- Ziplock storage bags;
- Large, heavy-duty plastic bag;
- Cushioning materials, (foam pellets, bubble wrap); and
- Courier airbills.

4.0 PROCEDURE

Environmental samples shall be packed prior to shipment by commercial air carrier using the following procedures:

1. Select a sturdy cooler in good repair. Secure and tape the drain plug (inside and outside) with fiber or duct tape. Line the cooler with a large heavy duty plastic bag. This practice keeps the inside of the cooler clean and minimizes cleanup at the laboratory after samples are removed.
2. Be sure the lids on all bottles are tight (will not leak). In many regions custody seals are also applied to sample container lids. The reason for this practice is two-fold: to maintain integrity of samples and keep lid on the container should the lid loosen during shipment. Check with the appropriate regional procedures prior to field work. In many cases, the laboratory manager of the analytical lot to be used on a particular project can also provide this information.
3. It is good practice to wrap all glass containers in bubblewrap or other suitable packing material prior to placing in plastic bags.

4. Place all bottles in separate and appropriately sized polyethylene bags and seal the bags with tape (preferably plastic electrical tape, unless the bag is a zipper-type bag). Up to three VOA bottles, separately wrapped in bubblewrap, may be packed in one plastic bag.
5. Place bubble wrap or other cushioning material in the bottom of the cooler and then place the bottles and jars in the cooler with sufficient space to allow for the addition of more cushioning material between the bottles and jars.
6. Put ice that has been placed in properly sealed, double-bagged, heavy duty polyethylene bags on top of and between the samples. Include a temperature blank so the laboratory can ensure proper temperature upon receipt. Fill all remaining space between the bottles or jars with packing material. Fold and securely fasten the top of the large heavy-duty plastic bag with tape (preferably electrical or duct).
7. Place the Chain-of-Custody Record and the Request for Analysis Form (if applicable) into a plastic bag, tape the bag to the inner side of the cooler lid, and then close the cooler and securely tape (preferably with fiber tape) the top of the cooler unit. Wrap the tape three to four times around each side of the cooler unit. Custody seals should be affixed to the top and sides of the cooler within the securing tape so that the cooler cannot be opened without breaking the seal.
8. Each cooler (if multiple coolers) should have its own Chain-of-Custody Record reflecting the samples shipped in that cooler.
9. Label according to 40 CFR 261.4(d). The shipping containers should be marked "THIS END UP." and arrow labels which indicate the proper upward position of the container should be affixed to the container. A label containing the name and address of the shipper and laboratory shall be placed on the outside of the container. It is good practice to secure this label with clear plastic tape to prevent removal during shipment by blurring of important information should the label become wet. The commercial carrier is not required to sign the COC record as long as the custody seals remain intact and the COC record stays in the cooler. The only other documentation required is the completed airbill, which is secured to the top of the shipping container. Please note several coolers/shipping containers may be shipped under one airbill. However, each cooler must be labeled as "Cooler 1 of 3, Cooler 2 of 3, etc.", prior to shipping. Additionally it is good practice to label each COC form to correspond to each cooler (i.e., 1 of 3, 2 of 3, etc.).

Standard Operating Procedure
For
Non Aqueous Phase Liquid Measurement

Prepared by: _____

Date: _____

Reviewed by: _____

Date: _____

Approved by: _____

Date: _____

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1.0 SCOPE

This Standard Operating Procedure (SOP) describes the methodology for measuring non aqueous phase liquid (NAPL) in monitoring wells and piezometers. Measurement of NAPLs is a useful tool for evaluating contaminant source areas and monitoring trends in contaminant behavior.

2.0 OBJECTIVES

- Ensure quality control in NAPL measurement.
- Ensure uniformity and continuity in measuring techniques by different qualified field personnel.
- Allow traceability of errors in NAPL measurement, and correction of improper procedures.

3.0 EQUIPMENT NEEDED

- Field notebook;
- Waterproof marking pens/ink pens;
- Plastic sheeting (Visqueen);
- Appropriate safety equipment;
- Interface probe;
- Nylon rope and weight;
- Knife or scissors;
- Tape measure;
- Disposable bailer;
- Decontamination equipment;
- Waterproof marking pens/ink pens.

4.0 PROCEDURES

Procedures required will depend on whether light NAPL (LNAPL) that forms lenses floating on top of the water table or dense NAPL (DNAPL) that sinks through the aquifer and forms lenses over lower permeability layers are present.

4.1 Interface Probe Measurements

The interface probe, which consists of a fluid detector attached to a graduated tape, is used for depth measurements in monitoring wells and piezometers. The probe has the capability of evaluating fluid in the monitoring wells for LNAPLs and DNAPLs. Manufacturer's recommendations for operation should always be followed. The following describes the operation of the interface probe:

1. Place the interface probe in the monitoring well/piezometer adjacent to the measuring mark on the top of the well casing.
2. Slowly lower the probe down the well until it intersects the top of the fluid layer. If LNAPLs are encountered the probe will "sound" a continuous tone. If water is encountered, the probe will "sound" an intermittent tone.

3. Record the depth to the top of the fluid in the field logbook. The probe has an accuracy of 0.01 foot.
4. Continue lowering the probe and record the depth of any change in tone (continuous or intermittent). If a solid tone is noted below the groundwater level, a DNAPL is present in the well. Record depth of DNAPL in log book.
5. Continue lowering the probe to the base of the well and record the total depth in the field logbook.
6. Properly decontaminate the probe. See SOP 190 for decontamination procedures.

4.2 Alternate Measurement Methods

Occasionally, certain types of NAPLs can be difficult to accurately measure using an interface probe. One alternative is to use a clear, disposable bailer to extract a portion of the water column in the well. This can be the bailer dedicated to the well for sampling. For LNAPLs, the bailer is slowly lowered so the top of the bailer does not fall below the top of the fluid layer and then removed from the well for measurement. For DNAPLs, the bailer is slowly lowered to the bottom of the well and then removed from the well for measurement. The NAPL thickness can be directly measured from the bailer using a tape measure. This method is not as accurate as using an interface probe, but can produce consistent results.

Another method for measuring DNAPLs is to use a clean nylon rope with a weight. The decontaminated weight is secured to the nylon rope and slowly lowered to the bottom of the well. On reaching the bottom of the well, the weight and rope are removed and placed on plastic sheeting for measurement with a tape measure. This method is not as accurate as using an interface probe, but can produce consistent results.